VOLUME 5

ENVIRONMENT

SITE PROPOSAL

SUPERCONDUCTING SUPER COLLIDER

STATE OF

MONTANA

COMANCHE BASIN

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BASIN

THE GREAT SEAL OF THE STATE OF MONTANA

VOLUME 5

ENVIRONMENT

The Comanche Basin site has many natural environmental advantages.

The preliminary environmental assessment indicates characteristics of the site contain nothing unique or rare.

There are no known rare or endangered species within the site.

The site includes no unique habitats or vegetation and presents minimal land use conflicts.

Socio-economic effects will be minimal as an infrastructure is in place to serve increased population. The project will improve the local economy.

Costs of environmental mitigation will be minor.

Montana will use a coordinated, consolidated permitting process to assist the project in regulatory compliance.

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5.1 WETLANDS

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ENVIRONMENT

The Comanche Basin site is situated in an internally drained basin among the rolling plains of south-central Montana, near the major regional center of Billings. The climate is continental, but moderated by the Rocky Mountains to the west, so that local weather conditions are generally temperate. It is a sparsely populated rural area characterized by mid-grass prairie, much of which is dryland farmed or grazed by livestock. Large rocky outcrops, with stands of ponderosa pine, provide visual relief. Native vegetation and animal species are generally typical of those found throughout eastern Montana. The basin contains several small ponds that support a variety of waterfowl.

Overall environmental impacts at the Comanche Basin site are expected to be minimal. Impacts on the natural environment will be temporary and localized, affecting resources that are common and abundant in the region. Some short- and long-term impacts to the human environment are inevitable; however, the socioeconomic benefits derived from the construction and operation of the SSC outweigh the unavoidable negative effects.

No significant impacts have been identified that would adversely affect the project's ability to comply with all applicable environmental regulations/requirements or the timely acquisition of necessary permits and other authorizations. No unusual and/or expensive mitigation measures are anticipated.

5.1 WETLANDS

The U.S. Geological Survey 1:24,000 scale topographic maps show no marshes within the site. Other surface water bodies in the internally drained basin, however, do exhibit some of the features that are characteristic of wetlands (See Figure 5.2-1). Existing literature as well as field reconnaissance in May through July 1987, and an analysis of aerial photographs of the site, indicate that many of the ephemeral, intermittent and perennial small ponds and potholes in the basin support vegetation and aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Wilson, 1987). These water features may constitute wetlands as defined by DOE in its regulations implementing Executive Order 11990 - Protection of Wetlands (10 CFR 1022 et seq.).

A thorough search of existing wetlands information available from state and federal agencies, including the U.S. Fish and Wildlife Service, Bureau of Land Management, Soil Conservation Service, Montana Department of Natural Resources and Conservation, Montana Department of Fish, Wildlife and Parks, and Montana Department of State Lands, has shown that little published data on wetlands exists for the Comanche Basin area (Wilson, 1987; Bierback, 1987). Thus, although preliminary field reconnaissance and successive-year aerial photograph analysis indicate that wetlands in this semi-arid basin are not extensive or unique to the site area, a formal wetlands assessment will be required to determine the precise extent and location of any wetland features which might qualify for protection under DOE Executive Order 11990. Based on the area's topography, it is likely that many of the surface water features qualifying as wetlands will be located within the center of the ring.

The ponds and potholes within the Comanche Basin that exhibit wetlands characteristics are discussed with other surface water features in Section 5.2.1; another large depression in the middle of the basin that is occasionally flooded, labeled the Comanche Flat, is discussed in Section 5.2.4.

5.2 SURFACE WATER

5.2 SURFACE WATER

5.2.1 Major Drainage Basins and Surface Water Features

The SSC facility will be largely within the drainage of the Comanche Basin, with portions of the SSC ring also intersecting ephemeral streams on the fringes of the Lake Basin and Painted Robe Creek watersheds to the west (Figure 5.2-1).

The 230-square-mile Comanche Basin is a closed, internally drained basin, with 198 permanent or intermittent small ponds, agricultural impoundments, and potholes and 46 ephemeral stream systems recorded by the USGS on 1:24,000 scale topographic maps of the basin. An analysis of these maps indicates a total of 172 first-order streams and 22 first-order stream systems, 16 second-order stream systems, 5 third-order stream systems and 3 fourth-order stream systems within the Comanche Basin. The stream ordering system advocated by Strahler (1952) was used. This stream ordering system indicates not only size and scale, but also an approximate index of the amount of flow that can be produced by stream systems (Gregory and Walling, 1973). The larger streams, including Comanche, Sand, Difficulty and Brown creeks, and the larger ponds, impoundments, and potholes of the Comanche Basin are shown on Figure 5.2-1.

Maps indicate 399 miles of intermittent streams and 25 miles of perennial small streams in the Comanche Basin. The ratio of the total stream distance to the surface area of the basin is 1.84 miles/miles^2, which is low, indicating the relative aridity of the basin (Wilson, 1987). The intermittent streams carry water when runoff is heavy, usually during spring. During the cold season, precipitation falls as snow, which typically melts by early spring. The period of heaviest rainfall is also May and June (see also Section 7.3). Approximately one year in ten, heavy runoff causes minor flooding of some streams. Summer precipitation almost always occurs in showers and seldom contributes significant runoff to streams (Meshnick et al., 1972; Parker et al., 1980). The topographic maps indicate that a few streams are fed by springs as well.

USGS maps indicate that the 102 perennial small ponds and impoundments cover 0.49 square miles, and the 96 intermittent ponds and potholes, 1.31 square miles, for a total of 1.80 square miles, or 78 percent of the entire water surface area of the Comanche Basin. Six intermittent and four permanent ponds exceed 10 acres in surface area. These ten largest ponds, numbered 1 through 10 on Figure 5.2-1, measure 776 acres (67 percent of the total surface water area). The surface area of the Spidel Waterfowl Production Area, the largest pond shown, measures 629 acres and contributes 55 percent of the total surface area of the mapped water features.

Although the site is almost entirely within the Comanche Basin, sections of the western part of the collider ring are located just outside the Comanche Basin in the Lake Basin and the Painted Robe Creek watersheds (Figure 5.2-1). Ring construction will disturb Lost Creek and its tributaries in several places as they flow south westward toward Halfbreed Lake and several smaller unnamed ponds that are part of the Halfbreed Lake National Wildlife Refuge. The Painted Robe Creek watershed to the northwest will also be affected. Ring construction will disturb Gooseneck Creek and its tributaries, along with another unnamed creek and its tributaries toward Painted Robe Creek, which flows to the Musselshell River. All of these features are classified as intermittent streams on the USGS topographic maps, with streamflow patterns similar to those characteristic of the Comanche Basin. Impacts to the ephemeral streams at the margins of these other watersheds may be confined to the immediate site through appropriate mitigation measures (Wilson, 1987; Section 5.8.2.2).

5.2.2 Surface Water Quantity

The streams within the site typically carry runoff only in spring and early summer. The perennial and intermittent ponds, potholes, and small reservoirs expand and contract with water supply from season to season and year to year.

Aerial photographs were analyzed to estimate the basin surface water resources. Aerial photographs of the area are available for July 1957, June 1979, and May 1980. Analysis indicated that the combined surface areas of the ten largest lakes varied between 417 acres and 516 acres during those years and seasons (compared with the 778 acres designated on the 1:24,000-scale USGS topographic maps) (Table 5.2-1). Only the surface areas covered with water in the aerial photographs are reported in this analysis; variations indicate the tendency for ponds and reservoirs to dry up quickly in the dry summer months following spring replenishment with snowmelt and spring rains. The surface areas designated on the aerial photographs corresponded closely (<5 percent variation) with the surface areas of the depressions occupied by these water bodies identified on the USGS maps (Wilson, 1987).

5.2.3 Surface Water Quality

No published water quality data are available for the lakes and streams in the Comanche Basin. However, the geologic materials and soils in the adjacent lake basin to the west are so similar that water quality data recorded for Big Lake is probably similar (Wilson, 1987). Big Lake drains soils of the Lardell-McKenzie association. These soils consist of deep, nearly level, somewhat poorly drained to poorly drained clay loams and clays (Parker et al., 1980). The Comanche Basin is dominated by soils of the Vananda-McKenzie-Arvada associations, which consist of level to gently sloping deep clays to loams over clay in a dry (closed) basin (Meshnick et al., 1972).

Table 5.2-1

Seasonal Variations in the Surface Areas of the Ten Largest Ponds (in acres)

Number	Name (if any)	1987 USGS Topographic Map Area	1979-80 Aerial Photograph Area	Aerial Photograph Area	Photo Areas as % of Topo Map
1	Spidel WPA	628.6	333.2	400.6	53-64
2	Broadview Pond	24.5	14.1	5.7	23-58
3	Alkali Pond	22.5	25.7	49.4	114-220
4	--	19.3	8.7	14.1	45-73
5	--	18.0	1.2	5.7	7-32
6	--	17.5	9.4	12.4	54-70
7	--	13.1	14.3	0.5	4-109
8	--	11.4	4.5	17.3	39-152
9	--	10.9	1.7	0.0	0-16
10	--	10.6	3.5	9.4	33-88
TOTALS		776.4	416.3	515.1	53-66

Note: All areas are given in acres. The numbers given in the first column refer to the surface water features identified on Figure 5.2-1.

The water quality data for Big Lake summarized in Table 5.2-2 indicates that surface water in the basin is a sodium sulfate type. Total NH_4 is relatively high, and both nitrogen and phosphorus levels are high enough to encourage plant growth. No data were available for dissolved oxygen. The water quality probably has some seasonal variation that cannot be identified with the data in Table 5.2-2, although the small range in water parameter values indicates that the water is homogeneous.

These conditions are consistent with the widespread occurrence of saline seeps in the Comanche Basin (Section 3.1.3). A number of factors present in the Comanche Basin and elsewhere in Montana aggravate the occurrence and spread of saline seep: the presence of soil, subsoil, and underlying geological formations that contain a nearly inexhaustible supply of water-soluble salts; a climate in which a large part of the annual precipitation occurs in spring before crops can utilize stored moisture effectively and before evapotranspiration is significant; a virtually impermeable material (shale or clay) beneath the soil profile that effectively impedes the downward movement of water, thus forming a "perched" or near-surface body of groundwater; and the development of a local groundwater flow system that allows saline groundwater to migrate from upland recharge areas toward nearby discharge (saline seep) areas (Thompson and Custer, 1976; Lewis et al., 1979; Miller et al., 1980).

To supplement the water quality data for Big Lake Basin, surface water samples were taken in the summer of 1987 from four small ponds and a stream in the Comanche Basin. These samples show pH ranging from 1270 mg/l to 8420 mg/l. The water quality data for the Comanche Basin indicates characteristics generally similar to those of Big Lake, although dissolved solids are not as high. Table 5.2-3 summarizes the available Comanche Basin surface water quality data from the Summer 1987 sampling.

5.2.4 Flood Areas and Frequencies

Because of the seasonal character of precipitation and runoff, the intermittent streams and small ponds are nearly always filled with water during spring and early summer but are frequently dry the rest of the year. In years with exceptionally heavy precipitation, the streams, potholes, and impoundments may flood small areas of adjacent farmland. Comanche Flat, the large depressional area in the middle of the basin, is flooded in wet years as well, although in most years this area dries up early enough in summer to be cultivated or used for grazing cattle (Wilson, 1987) (Figure 5.2-1).

The 1979-1980 aerial photographs were used to quantify the extent of flooding in Comanche Flat, since 1.6 times the normal precipitation was measured at Broadview in 1978 (22.19 inches compared with the 1951-1980 thirty-year annual average of 13.99 inches). This water drained to Comanche Flat and flooded an area in excess of the 526 acres that was still under water when the May 1980 aerial photographs were taken. Evaporation may take several years, as indicated by the 1978 precipitation and the 1980 aerial photographs, since 1977, 1979, and 1980 were relatively dry years. The flooded area was almost (67 percent) as large as the surface water features designated on the USGS topgraphic maps, indicating the presence of a large floodplain in the center of the basin (Wilson, 1987).

Table 5.2-2

Water Quality Data For Big Lake, Lake Basin, Montana

Water Quality Parameters	Units	Average	Range
Calcium, dissolved	mg/l	68	55-100
Chloride, dissolved	mg/l	414	380-480
Fluoride, dissolved	mg/l	0.4	None
Hardness	mg/l	2580	2300-3200
Hardness, N. Carb. L-EP	mg/l	2100	1900-2600
Iron, dissolved	ug/l	60	50-80
Magnesium, dissolved	mg/l	578	530-700
Manganese, dissolved	ug/l	140	10-660
Nitrogen, dissolved $NO_2 + NO_3 - N$	mg/l	<0.1	None
Nitrogen, total $NO_2 + NO_3 - N$	mg/l	<0.1	None
Nitrogen, total NH_4 as N	mg/l	0.30	0.01-0.42
Nitrogen, total Org. as N	mg/l	3.1	2.7-3.6
Nitrogen NH_4 + 5 g as N	mg/l	3.4	3.0-4.0
pH (laboratory)	Units	8.8	8.6-8.9
pH (field)	Units	9.0	8.8-9.2
Phosphorus, total (total - PO4)	mg/l	0.16	0.12-0.34
Phosphorus, total	mg/l	0.05	0.04-0.11
Potassium, dissolved	mg/l	18.8	18-19

Table 5.2-2 (Continued)

Water Quality Data For Big Lake, Lake Basin, Montana

Water Quality Parameters	Units	Average	Range
Silica, dissolved	mg/l	1.4	<1.2-2.4
Sodium, absorption ratio	--	20	18-22
Sodium, dissolved	mg/l	2340	2100-2900
Sodium, percent	%	66.6	65-67
Specific conductance (field)	umhos	11900	11200-13700
Specific conductance (lab)	umhos	11200	10600-13200
Sulfate	mg/l	6380	58000-80000

Range from 5 samples collected in December 1983

Table 5.2-3

Water Quality Data For Comanche Basin, Montana

Water Quality Parameters	Units	Average	Range
Temperature	°F	77	68-86
pH	Standard Units	8.5	8.0-9.2
Dissolved Oxygen	mg/l	10.7	9.9-13
Turbidity	NTu	15.7	1.8-46
Total Solids	mg/l	3934	1330-8730
Total Dissolved Solids	mg/l	3790	1270-8420
Total Alkalinity as $CaCO_3$	mg/l	390	190-689
Total Kjeldahl Nitrogen as N	mg/l	2.1	0.6-4.5
Ammonia Nitrogen as N	mg/l	0.6	0.4-0.7
Nitrate + Nitrite as N	mg/l	<0.05	None
Ortho-Phosphorus as P	mg/l	0.1	0.50-0.13
Bicarbonate Alkalinity as HCO_3	mg/l	431	193-808
Dissolved Metals			
Arsenic as As	mg/l	0.01	<0.005-0.012
Barium as Ba	mg/l	<0.1	None
Boron as B	mg/l	0.5	0.2-1.0
Cadmium as Cd	mg/l	<0.005	None
Chromium as Cr	mg/l	<0.02	None
Cobalt as Co	mg/l	<0.05	None
Copper as Cu	mg/l	<0.02	None

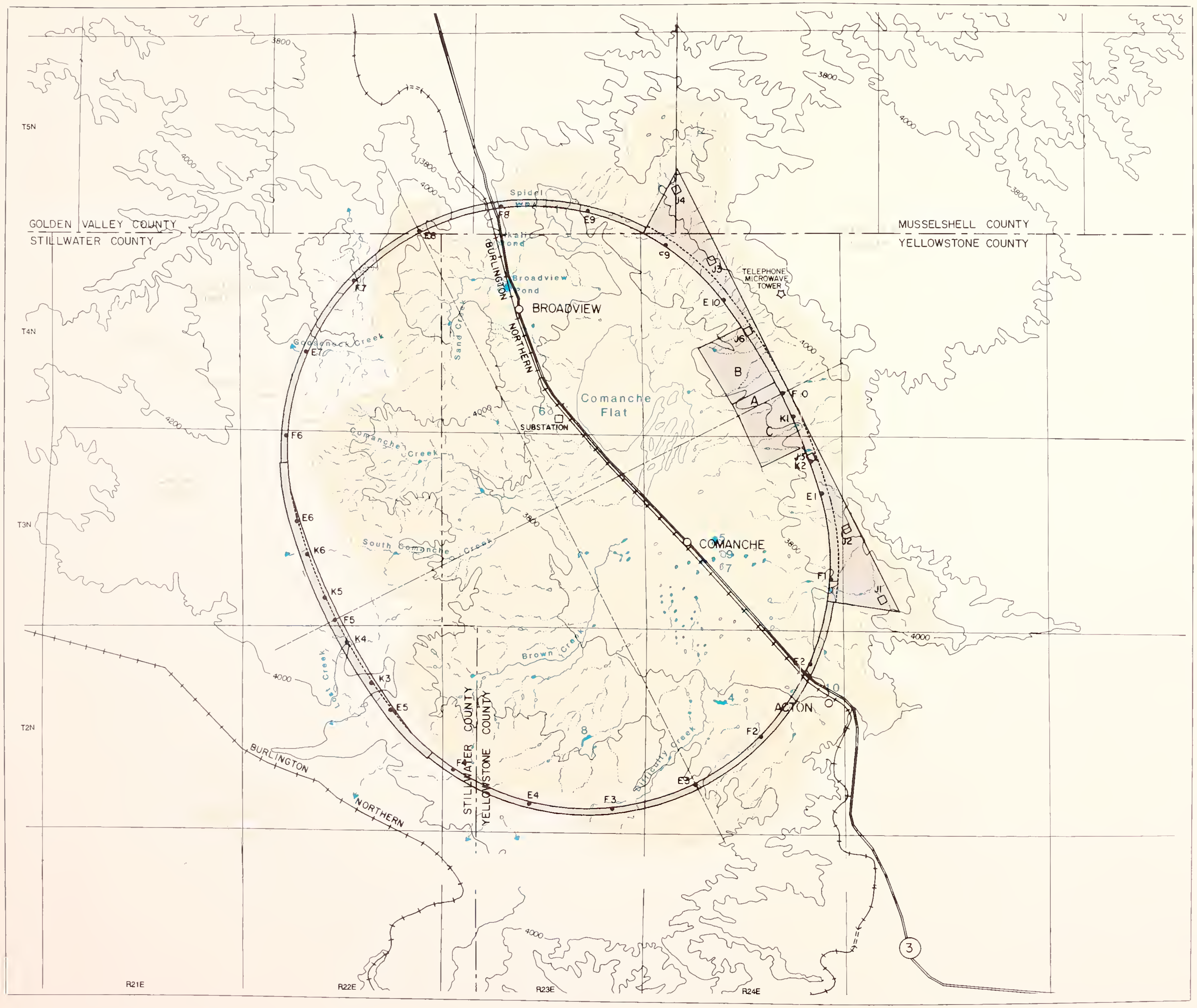
Table 5.2-3 (Continued)

Water Quality Data For Comanche Basin, Montana

Water Quality Parameters	Units	Average	Range
Iron as Fe	mg/l	0.35	.06-.81
Lead as Pb	mg/l	<0.02	None
Manganese as Mn	mg/l	0.31	.07-.83
Molybdenum as Mo	mg/l	<.05	None
Nickel as Ni	mg/l	<.02	None
Selenium as Se	mg/l	<.005	None
Vanadium as V	mg/l	<0.2	None
Zinc as Zn	mg/l	<.02	None

* Data collected on July 28, 1987

Figure 5.2-1 SURFACE WATER FEATURES



LEGEND

DRAINAGE BASIN BOUNDARY

COMANCHE BASIN

PERENNIAL STREAM

INTERMITTENT STREAM

PERENNIAL WATER BODY

INTERMITTENT WATER BODY/
OCCASIONALLY FLOODED AREA
(Maximum extent of fluctuation)

2*

*Water Body Numbers refer to 10 largest ponds (surface area) in Comanche Basin (see Table 5.2-1).

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5.3 FISH AND WILDLIFE

5.3 FISH AND WILDLIFE

The surface water resources and vegetation in the vicinity of the site provide habitat for a moderate range of wildlife species. Vegetation at the proposed site consists primarily of mid-grass prairie, with some wetland vegetation in basin lowland areas, with ponderosa pine cover on the rock outcroppings and broken drainage slopes outside the site's eastern perimeter. A detailed discussion of botanical resources is presented in Section 5.4. Significant portions of the proposed site are now cultivated for dryland crops or used for livestock grazing, altering the natural habitat and influencing the kinds and numbers of wildlife species occurring there. The area is not considered unique or uncommon wildlife habitat. Similar habitat exists in relative abundance in the region (Hoem, 1987).

5.3.1 Significant Fish and Wildlife Resources

5.3.1.1 Mammals

The predominant big game species in the area are pronghorn antelope and mule deer (Eustace, 1987; BPA et al., 1979).

Antelope are abundant throughout the region, occurring at a density of approximately five per square mile (Eustace, 1987). The extensive grassland and shrub/grassland vegetation at the site are good antelope habitat for much of the year. Browse, especially sagebrush, constitutes an essential and significant forage item for pronghorn year-round. This diet is supplemented in the spring with succulent green grasses and in the summer and early fall with seasonal forbs. In the later fall and winter, the pronghorn again rely heavily on browse (BLM, 1983b). There are no antelope wintering areas in the vicinity of the proposed site, due to the general lack of adequate vegetation. Their winter habitat requirements include comparatively taller and more dense stands of sagebrush and other shrubs, both for forage during periods of heavy snow cover and for protection of their young from harsh weather (BPA et al.; 1979, BLM, 1983b; DNRC, 1974b).

The presence of mule deer varies widely over the area, averaging between 1.4 to 3.7 per square mile depending on the year (Eustace, 1987). Mule deer tend to inhabit the wooded areas and broken side slopes of drainages to the east of the site. This area, outside the site perimeter, has been identified by one study as critical mule deer habitat (DNRC, 1974b). More recent studies, however, have not identified any mule deer winter ranges or year-long high density areas near the proposed site (e.g., BPA et al., 1979). Mule deer also are likely to occupy upland areas within the site where sagebrush is the dominant shrub. Their diet closely resembles that of the pronghorn, consisting of browse throughout the year, but they feed extensively on succulent green grasses in the spring until forbs are available throughout the summer and into the fall. Mule deer rely upon woody vegetation cover for protection from predators and extreme weather (BLM, 1983b; DNRC, 1974b).

White-tailed deer tend to occupy drainage basins with riparian vegetation, occurring outside the proposed site, but they may enter the area periodically.

The most prevalent predators in the region include the coyote, bobcat, lynx, and red fox (BLM, 1983b; BLM, 1981). Their incidence at the proposed site is unknown. Striped skunks are commonly associated with the agricultural areas. Numerous small mammals, an important food source for both predatory mammals and raptors, also occur in the area. These include the jackrabbit, cottontail rabbit, prairie dog, ground squirrel, and many small rodents, such as the western deer mouse (Id., DNRC, 1974b).

5.3.1.2 Birds

Several species of game birds occupy the site. Sage grouse are the most widely distributed and abundant game bird species, occurring at densities of 5 to 17 per square mile depending on the year (Eustace, 1987). They are highly dependent on sagebrush for both cover and food, preferring at least 15 percent canopy coverage. They are primarily associated, therefore, with the sagebrush communities in the grassland basin and in the pine forested area east of the site. These areas both may contain sage grouse strutting grounds (DNRC, 1974b). They also nest under sagebrush, generally within 2 miles of mating grounds. Sagebrush is also a significant portion of their diet, augmented mostly by seasonal forbs. Their winter diet is almost exclusively sagebrush. No critical winter habitat for the species has been identified in the area (Id., BLM, 1983b).

Sharp-tailed grouse also occur, at densities of 2 to 10 per square mile depending on the year. They may be expected to concentrate near the ridges which border the Comanche Basin to the east and which provide the upland prairie trees, shrubs and grasses on which they depend. Dancing grounds may exist in that area (DNRC, 1974b), and females nest and raise their broods usually within 1 mile of mating grounds. Their diet is varied. In the spring, it consists largely of greens such as grasses, flower parts, clover, forbs and cultivated grains. Sharp-tailed grouse feed heavily on insects in the summer, as well as leaves from succulent plants, dry seeds and fleshy fruits. Their fall diet shifts again to grasses, seeds, cultivated grains and tree and shrub fruits. Winter time is the most critical, when they rely heavily on twig tips of various trees and shrubs. No critical winter habitat has been identified in the area for sharp-tailed grouse, either (Id., BLM, 1983b).

Introduced game bird species that may be present throughout the area include the Hungarian partridge (Eustace, 1987), especially where range and cropland are interspersed, and the chukar partridge. Merriam's turkey also may occur in timbered areas outside the eastern perimeter of the proposed site (BLM, 1983b; BLM, 1981; DNRC, 1974b; BPA et al., 1979).

Waterfowl represent the largest potential avian resource in the Comanche Basin. Small ponds and potholes occur throughout the area from Big Lake and Halfbreed Wildlife Refuge, outside the western boundary of the site, across Comanche Basin Flat, to Hay Basin outside the site's northeastern boundary. Within the Comanche Basin, these surface water bodies are largely ephemeral or intermittent, created by run-off and clayey soils. These potholes are attractive for breeding and stopovers to various kinds and numbers of waterfowl, other water birds, and shorebirds, depending upon the extent and duration of the water resource in a given year (Hoem, 1987; DNRC, 1974a; DNRC, 1976). The largest such area within the proposed site is the Spidel Waterfowl Production Area, 3 miles northeast of Broadview and administered by the U.S. Fish and Wildlife Service (Fries, 1987a).

In wet years, the Comanche Basin surface water features may support significant waterfowl populations. As stated by the Montana Department of Fish, Wildlife and Parks, "During years of abundant moisture such as the late 70's and early 80's, the area around Broadview is extremely important to waterfowl. Independent surveys...all came up with an estimated 100,000 waterfowl in this area" (Eustace, 1987). One such survey was made in 1980, when standing water was extensive after previous wet years. Rough estimates of monthly average bird populations, based on ground observations, were as follows: "During the 1980 breeding and nesting season, the wetland supported an estimated population of 45,000 birds including 32,000 dabbling ducks, 4,000 eared grebes, 3,000 American coots..., and lesser numbers of numerous other species of marsh and water birds. Bird populations increased in August, when large numbers of migrating shorebirds were attracted to the exposed mudflats. An influx of ducks, including 30,000 blue-winged teal... and 15,000 pintails..., brought the bird populations to a peak of approximately 100,000 birds at the end of August. Bird numbers then decreased steadily until freeze-up" (Malcolm, 1982).

Even in dry years, there is some water in the Comanche Basin where limited waterfowl breeding will occur, such as in the borrow pits alongside the highway. Waterfowl will generally nest and raise their young in areas which will remain wet for a month or so, then walk their young overland to larger and more permanent water bodies, although this results in high losses of young (Hoem, 1987). Waterfowl populations during such dry periods, however, are comparatively low, with total numbers "in the 100's" (Eustace, 1987).

In summary, bird populations using the Comanche Basin area for breeding and stopovers are extremely variable, depending upon the amount of standing water in the basin. There are other waterfowl use areas in the surrounding region, including several Waterfowl Production Areas (WPA) and National Wildlife Refuges (NWR) administered by the U.S. Fish and Wildlife Service (Fries, 1987a).

The proximity of the planned site powerlines to the waterfowl use areas is a particular concern. The problem of waterfowl colliding with powerlines has been extensively studied (Malcolm, 1982; Hoem, 1987). This issue is further discussed in Section 5.8.3.2.

Other birds in the general area of the proposed site include raptors such as golden eagles and red-tailed hawks and numerous species of passerine birds (Hoem, 1987).

5.3.1.3 Other Species

Reptiles found in the area include the prairie rattlesnake, bull snake, plains hognose snake, and western and plains garter snake. Amphibians likely include toads, leopard frogs, and tiger salamanders (BLM, 1981; Hoem, 1987).

The surface water resources at the site preclude any significant impact on fisheries. One study of the area concluded that "the temporary ponds and marshes in the area... do not support a fishery of any importance" (DNRC, 1976). Any fish are likely to have been stocked (Hoem, 1987). The Montana Department of Fish, Wildlife and Parks indicates that their only fishery in the area is Broadview Pond, which they plan to manage as a bass-crappie fishery although "the resurgent carp population makes the future for this fishery appear marginal." The only other active fisheries are some private farm ponds stocked from private hatcheries (Darling, 1987). By contrast, there are excellent fisheries outside the proposed area in the Musselshell River basin to the north and the Yellowstone River basin to the south.

5.3.2 Threatened or Endangered Species

The proposed site vicinity does not support any known populations of federally listed threatened or endangered species (Eustace, 1987).

The black-footed ferret, classified an endangered species, once was found in association with prairie dog colonies in eastern Montana but now is believed to be extinct in the state. The most recent confirmed sighting in the general region of the proposed site was in Wheatland County during the 1940's (DNRC, 1974a; BPA et al., 1979; BLM, 1983b; ERT, 1980). No black-footed ferrets, therefore, are expected to exist near the proposed site, despite the likely occurrence of prairie dog towns.

Other threatened or endangered mammals that may occur in the area, although it is considered highly improbable, are the northern swift fox and the gray wolf (BLM, 1981; DNRC, 1974a, ERT, 1980). The lynx is another mammal of special interest or concern which occasionally may be found in the region (DNRC, 1974b; BPA et al., 1979; BLM, 1983b; BLM, 1981).

The only threatened or endangered bird species known to visit the proposed site vicinity are the bald eagle and the peregrine falcon. No active aeries are believed to exist in the area. The bald eagle winters and feeds in significant concentrations in the Yellowstone and Clarks Fork river drainages far to the south, and migrating members may be observed on rare occasions in the site vicinity. There also have been occasional sightings of peregrine falcons in the area in recent years. Their use of the area also is believed to be related to migration (Fries, 1987a; Hoem, 1987; BLM, 1983b; BLM, 1981; DNRC, 1974b; BPA et al., 1979; ERT, 1980). Other bird species of special interest or concern which may inhabit or frequent the area include the golden eagle (Id.).

No reptile, amphibian, or fish species classified as threatened or endangered are likely to inhabit the area (Hoem, 1987; BPA et al., 1979).

5.4 VEGETATION

5.4 VEGETATION

The Comanch Basin site is characterized primarily by mid-grass prairie, with some wetland vegetation in lowland areas and with ponderosa pine cover on the rock outcroppings and broken drainage slopes outside the site's eastern perimeter. No threatened or endangered plant species are known or expected to occur in the vicinity (Heinze, 1987).

A significant portion of the area is cultivated for dryland farming or used for livestock grazing. There are no prime farmlands in the area (Robertson, 1987; BPA et al., 1979).

5.4.1 Significant Botanical Resources

The site lies in the Northern Great Plains physiographic province. The Soil Conservation Service (SCS) has identified five broad geographic zones in Montana to aid in describing the native vegetation and rangeland, including the Western Sedimentary Plains where the site is located. Vegetation in this zone consists primarily of grassland and shrub/grassland types, as well as some Conifer-Savannah vegetation. The specific botanical resource is dictated by soil, aspect, climate, elevation, and land uses (Ross and Hunter, 1976; BLM, 1983b; BLM, 1981).

5.4.1.1 Existing Vegetation Types

The Comanche Basin area itself is mixed prairie grassland, encompassing three climax vegetation types, according to the SCS classification system, which is based primarily on soil and climate (See Figure 5.4-1). These include the "Dense Clay-Clayey- Saline Upland Range Site Complex" in the low-lying and poorly drained center of the basin, the "Clayey and Shallow Clay Range Site Association" predominant on the western side of the basin and part of the eastern side, and "Silty Range Site" on the remaining ground (Ross and Hunter, 1976; BLM, 1983b). Table 5.4-1 lists the dominant climax vegetation species found in each of these areas, along with species that increase with grazing pressure, such as that in most parts of the basin not already cultivated.

This general characterization was further refined through an on-site inventory of the local botanical resource (Ross and Hunter, 1976). One preliminary inventory of the area revealed that the three grassland dominants are western wheatgrass, needleandthread, and blue grama. Other abundant grasses include Sandberg bluegrass, green needlegrass, bluebunch wheatgrass, and prairie junegrass. Threadleaf sedge and needleleaf sedge also are common, as are phloxes. Shrubs are codominant with grasses in much of the area. The most prevalent shrubs are the sagebrushes, with fringed sagewort most frequently encountered, and big sagebrush exerting a strong community influence when present. Plains pricklypear also is abundant in more heavily grazed areas. It was further found that "the only other distinctive rangeland community of significant extent is found in lowlands of the Comanche Basin having heavy and alkaline soils, and is dominated by greasewood and western wheatgrass" (DNRC, 1976; see also, DNRC, 1974b).

Other surveys have revealed two additional vegetation types of interest in the proposed project vicinity. One is the occasional occurrence in the basin lowlands, to a greater or lesser degree depending upon surface water conditions, of wetlands-type vegetation. It was noted by one investigator that "the wetland usually is dry and normally is dominated by western wheatgrass... The wetland occasionally holds standing water for several years... [After one such period, vegetation] was sparse in spring except for dense beds of algae (Tetraspora spp.) around the shoreline. Most of the wetland was dominated by narrow-leaved waterplantain (Alisma gramineum) during the growing season. Some areas supported stands of spikerush (Eleocharis spp.), hardstem bulrush (Scirpus acutus), and cattail (Typha spp.). The only submerged aquatic species noted was sago pondweed (Potamogeton pectinatus), commonly occurring in scattered beds" (Malcolm, 1982).

The other vegetation type of interest lies outside the eastern boundary of the proposed site, where there are shale and sandstone uplands which support scattered stands of ponderosa pine. These often occur along north-facing sandstone outcrops. Basal areas and mean tree heights are low, and growth is slow. The understory of these stands is often sparse. Rocky mountain juniper may be associated with ponderosa pine, especially on the poorer, droughty soils of the shaley breaks. Other common associates are skunkbush sumac, bluebunch wheatgrass, and many previously mentioned prairie species. Some stands resemble a more open savannah type, with scattered pinetrees and grasslands (DNRC, 1976; see also DNRC, 1974b).

Table 5.4-1

Climax Vegetation
(By Soil Unit)

Soil Units	Dominants in the Climax Vegetation	Plants that Increase with Grazing Pressure**
24. Forest-Grassland Complex (12-14" P.Z.)***	(On very shallow to deep soils with frigid temperature regimes. These soils have light brown, loamy surfaces and occur on rolling to hilly terrain.	
Forest: (50%)	Ponderosa pine	Needleandthread
	Rocky Mountain juniper	Western wheatgrass
	Little bluestem	Prairie junegrass
	Bluebunch wheatgrass	Snowberry
	Sideoats grama	Fringed sagewort
	Skunkbush sumac	Other weedy forbs
	Western wheatgrass	Annuals
	Native legumes	
	(Rocky Mountain juniper will increase in areas where ponderosa pine has been removed by fire, logging, insects, or disease.)	
Grassland: (50%)	Little bluestem	Needleandthread
	Needleandthread	Blue grama
	Western wheatgrass	Threadleaf sedge
	Green needlegrass	Prairie junegrass
	Bluebunch wheatgrass	Sandberg bluegrass
	Prairie sandree	Big sagebrush
	Big bluestem	Fringed sagewort
	Native legumes	Hairy goldenaster
	Skunkbush sumac	Other weedy forbs
	Yucca	Broom snakeweed
	Prairie junegrass	Annuals
	Blue grama	

Table 5.4-1 Continued

Climax Vegetation
(By Soil Unit)

Soil Units	Dominants in the Climax Vegetation	Plants that Increase with Grazing Pressure**
27. Silty Range Site (10-14" P.Z.)	Bluebunch wheatgrass Western and thickspike wheatgrass Needle and thread Green needlegrass Basin wildrye Threadleaf sedge Prairie junegrass Native legumes Big sagebrush Skunkbush sumac Common chokecherry Blue grama	Blue grama Needleandthread Sandburg bluegrass Threadleaf sedge Prairie junegrass Big sagebrush Western snowberry Rabbitbrush Broom snakeweed Fringed sagewort Hairy goldenaster Western yarrow Pussytoes Other weedy forbs Annuals
31. Clayey and Shallow Clay Range Site Association (10-14" P.Z.)	Western and thickspike wheatgrass Bluebunch wheatgrass Green needlegrass Big sagebrush Prairie junegrass Plains reedgrass Prairie sandreed (Growing on fractured shale outcrops) Milkvetch	Big sagebrush Blue grama Prairie junegrass Needle and thread Sandberg bluegrass Rabbitbrush Broom snakeweed Eriogonum Annuals White pointloco Milkvetch Onion Other weedy forbs

Table 5.4-1 Continued

Climax Vegetation
(By Soil Unit)

Soil Units	Dominants in the Climax Vegetation	Plants that Increase with Grazing Pressure**
34. Dense Clay-Clayey-Saline Upland Range Site Complex		
(10-14" P.Z.)		
Dense Clay:	Western and thickspike wheatgrass Green needlegrass Inland saltgrass Big sagebrush Nuttall saltbrush Greasewood Prairie junegrass Sandberg bluegrass	Big sagebrush Rabbitbrush Prairie junegrass Sandberg bluegrass Inland saltgrass Onion Other weedy forbs Annuals
Clayey:	Same as Site No. 31	
Saline Upland:	Alkali sacaton Western and thickspike wheatgrass Greasewood Nuttall saltbrush Basin wildrye Inlands saltgrass Big sagebrush Bottlebrush squirreltail	Greasewood Big sagebrush Inland saltgrass Bottlebrush squirreltail Plains pricklypear Sandberg bluegrass

Table 5.4-1 Continued

Climax Vegetation
(By Soil Unit)

Soil Units	Dominants in the Climax Vegetation	Plants that Increase with Grazing Pressure**
36. Forest-Grassland (12-14" P.Z.)	(On very shallow to deep soils with a frigid temperature regime. These soils have light brown, loamy surfaces and occur on all rolling to steep terrain).	
Forest: (50%)	Ponderosa pine Rocky Mountain juniper Bluebunch wheatgrass Western wheatgrass Skunkbush sumac Snowberry Needleandthread	Needleandthread Western wheatgrass Prairie junegrass Snowberry Rose Fringed sagewort Other weedy forbs
Grassland: (50%)	Bluebunch wheatgrass Needleandthread Western and thickspike wheatgrass Green needlegrass Big sagebrush Prairie sandreed Native legumes Prairie junegrass	Needleandthread Western and thickspike wheatgrass Blue grama Sandberg bluegrass Big sagebrush Broom snakeweed Rabbitbrush Fringed sagewort Hairy goldenaster Other weedy forbs Annuals

*Listed in approximate order of dominance
**Based primarily on response to grazing pressure by cattle
***P.Z. = Precipitation Zone

Source: Ross, R.L. and H.E. Hunter, 1976.
Soil Conservation Service (SCS), Bozeman, MT.
Climax Vegetation of Montana, Based on Soils and Climate

5.4.1.2 **Agricultural Resources**

Most of the land in the basin is or has been cultivated for dryland farming, the main crops being winter wheat and barley (DNRC, 1974b Map; USDA Committee for Rural Development, 1973; Meshnick, et al., 1972). There are no prime farmlands in the area (Robertson, 1987; BPA et al., 1979). Land productivity varies considerably due to the complexity in depth and aspect of the soils. Recent herbage yields from several typical sites in this type are as follows:

> In the 10-14 inch precipitation zone, silty, sandy and clayey sites produce between 700 and 1400 pounds/acre annually;
>
> Strongly saline sites produce an estimated yield of 300 pounds/acre in normal rainfall years, with very little herbage production evident during low precipitation periods (BPA et al., 1979).

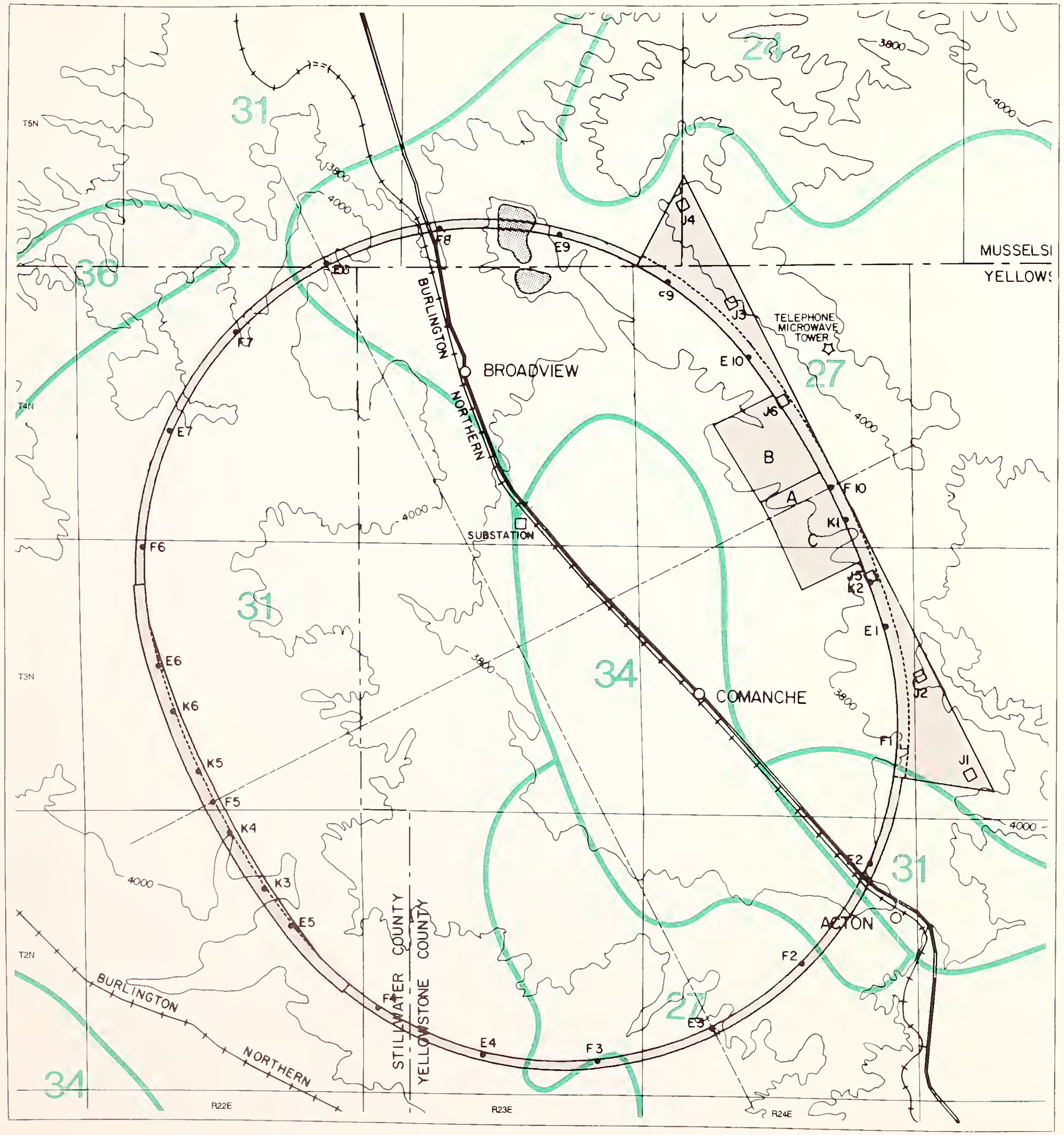
Extensive irrigation to upgrade this land is not generally considered feasible (BOR, 1972). Only one local farmer is known to irrigate portions of his land.

Much of the remainder of the Comanche Basin site serves as rangeland (USDA Committee for Rural Development, 1973). Range production may vary widely, with average production for the area estimated at 3.0 to 4.0 acres/Animal Unit Month (a/AUM) (DNRC, 1974b, see also BPA et al., 1979).

The isolated ponderosa pine stands in the site vicinity are not sufficiently accessible, extensive or sizeable to justify commercial exploitation (DNRC, 1974b; BPA et al., 1979).

5.4.2 <u>Threatened or Endangered Species</u>

No threatened or endangered plant species are known or anticipated at the proposed site (Heinze, 1987). The only two sensitive species under consideration by the BLM for this classification that may occur in the general region are a buckwheat (Eriogonum lagopus) and a watercress (Rorippa calycina). Neither has been located in the region to date (BLM, 1983b; BLM, 1981).



LEGEND

24 FOREST-GRASSLAND COMPLEX
12-14" P. Z., on very shallow to deep soils with a frigid temperature regime and light brown, loamy surfaces on rolling to hilly terrain.

FOREST (50%)
Ponderosa pine
Rocky Mountain juniper
Little bluestem
Bluebunch wheatgrass
Sideoats grama
Skunkbush sumac
Western wheatgrass
Native legumes

GRASSLAND (50%)
Little bluestem
Needleandthread
Western wheatgrass
Green needlegrass
Bluebunch wheatgrass
Prairie sandreed
Big bluestem
Native legumes
Skunkbush sumac
Yucca
Prairie junegrass
Blue grama

27 SILTY RANGE SITE
10-14" P. Z.

Bluebunch wheatgrass
Western and thickspike wheatgrass
Needleandthread
Green needlegrass
Basin wildrye
Threadleaf sedge
Prairie junegrass
Native legumes
Big and silver sagebrush
Skunkbush sumac
Common chokecherry
Blue grama

31 CLAYEY AND SHALLOW CLAY RANGE SITE ASSOCIATION
10-14" P. Z.

Western and thickspike wheatgrass
Bluebunch wheatgrass
Green needlegrass
Big sagebrush
Prairie junegrass
Plains reedgrass
Prairie sandreed
Milkvetch

34 DENSE CLAY-CLAYEY-SALINE UPLAND RANGE SITE COMPLEX
10-14" P. Z.

DENSE CLAY
Western and thickspike wheatgrass
Green needlegrass
Inland saltgrass
Big sagebrush
Nuttall saltbrush
Greasewood
Prairie junegrass
Sandberg bluegrass

CLAYEY
Same as Site No. 31

36 FOREST-GRASSLAND COMPLEX
12-14" P. Z., on very shallow to deep soils with a frigid temperature regime. These soils have light brown, loamy surfaces and occur on rolling to steep terrain.

FOREST (50%)
Ponderosa pine
Rocky Mountain juniper
Bluebunch wheatgrass
Western wheatgrass
Skunkbush sumac
Snowberry
Needleandthread

GRASSLAND (50%)
Bluebunch wheatgrass
Needleandthread
Western and thickspike wheatgrass
Green needlegrass
Big sagebrush
Prairie sandreed
Native legumes
Prairie junegrass

Source: Ross and Hunter, 1976.

N

1 0 1 2 3
MILES

5.5 AIR QUALITY

5.5 AIR QUALITY

5.5.1 Existing Air Quality and Air Quality Limitations

Sources of air pollutants in the site area include agricultural activities in the vicinity, which generate particulates; and petroluem refineries and coal-fired power plants in Billings which emit sulfur dioxide, nitrogen dioxide, and particulates. The sources in Billings are approximately 15 miles southeast of the site. Dispersion modeling conducted by the State of Montana Air Quality Bureau (AQB) for the Billings area indicates that no significant concentrations of any regulated pollutant should occur at that distance from Billings (Sternberg, 1983). Moreover, the site is upwind of the Billings area, and consequently winds blow infrequently from the direction of Billings. (Wind rose data and a detailed summary of meteorological conditions affecting dispersion characteristics of the region are contained in Section 7.3).

There has been no monitoring of air pollutants in the Acton- Broadview area. The AQB has monitored total suspended particulates (TSP) at several background locations in Eastern Montana and believes that these measured concentrations are representative of the site (Robbins, 1987). The TSP data from the AQB's background sites indicate that annual TSP concentrations in rural, agricultural areas of eastern Montana generally average from 15 to 35 micrograms per cubic meter (ug/m3) in areas devoted to grain cultivation and 8 to 20 ug/m3 in areas used for pasture and grazing. The highest 24-hour average TSP concentrations that can be expected are 50 to 150 ug/m3 in cultivated areas and 25 to 35 ug/m3 in pasture and grazing areas (Raisch, 1982).

An air quality permit will be necessary for the construction of the project. The primary regulatory concern would involve total suspended particulates generated by construction activities, which may be mitigated by a number of dust suppression measures.

The federal and Montana air quality standards are listed in Table 5.5-1. The Montana ambient standards generally are somewhat more restrictive than the federal standards. The attainment status of the area, as defined by the 1977 Clean Air Act Amendments, is "unclassified" for all pollutants. The area is classified as Class II under the Prevention of Significant Deterioration (PSD) Regulations.

Table 5.5-1

Montana and National Air Quality Standards

Pollutant	Montana Standard	Federal Primary Standard	Federal Secondary Standard
Total Suspended Particulates	75 ug/m3 annual average 200 ug/m3 24-hour average	75 ug/m3 annual geometric mean 260 ug/m3 24-hour average*	60 ug/m3 annual geometric mean 150 ug/m3 24-hour average*
Sulfur Dioxide	0.02 ppm annual average 0.10 ppm 24-hour average* 0.50 ppm 1-hour average**	0.03 ppm annual average 0.14 ppm 24-hour average*	0.5 ppm 3-hour average*
Carbon Monoxide	9 ppm 8-hour average* 23 ppm hourly average*	9 ppm 8-hour average* 35 ppm 1-hour average*	9 ppm 8-hour average
Nitrogen Dioxide	0.05 ppm annual average 0.30 ppm 1-hour average*	0.05 ppm annual average	0.05 ppm annual average
Ozone	0.10 hourly average*	0.12 ppm 1-hour average*	0.12 ppm 1-hour average*
Lead	1.5 ug/m3 90-day average	1.5 ug/m3 calendar quarter average	None
Foliar Fluoride	20 ug/g monthly average	None	None
Hydrogen Sulfide	0.05 ppm hourly average*	None	None
Dustfall	10 gm/m2 30-day average	None	None
Visibility	Particle scattering coefficient of 3 X 10-5 per meter annual average***	None	None

*	Not to be exceeded more than once per year
ug/m3	Micrograms pollutant per cubic meter of sampled air
Ppm	Parts pollutant per million parts of sampled air
**	Not to be exceeded more than 18 times per year
***	Applies to PSD Class I areas

5.6 BACKGROUND RADIATION

5.6 BACKGROUND RADIATION

The sedimentary rocks underlying the Comanche Basin generally contain very small amounts of radioactive elements that contribute to the low background radiation observed. There are two geologic formations under the Comanche Basin that may contain slightly elevated concentrations of uranium and other radioactive elements. These formations are the Bearpaw shale, which locally contains deposits of bentonite, and the Virgelle sandstone, a favorable environment for "Texas" roll-type deposits that may contain enriched uranium concentrations (Warchola and Stockton, 1982).

As part of the National Uranium Resource Evaluation (NURE), an airborne gamma ray and total magnetic field survey of the Comanche Basin and the surrounding area was made in 1978. Results of these analyses are presented in Tables 5.6-1 and 5.6-2. The NURE airborne study evaluated the average radiation in the area as a function of geologic unit. These data indicate average radiation levels due to thallium-208 to be 35 to 40 counts per second for the formations present under the Comanche Basin. For bismuth-214, the average radiation values were 12 to 17 counts per second, and for potassium-40, the average radiation was 125 to 140 counts per second.

The NURE airborne study was supplemented by geochemical sampling of groundwater and stream sediments. The analyses of groundwater taken from the Comanche Basin indicated uranium concentrations of 4 to 16 parts per billion (ppb). The stream water samples taken in the area had uranium concentrations ranging from 10 to 65 ppb. The stream sediment samples taken in the Comanche Basin indicated uranium concentrations of 2 to 4 parts per million (ppm) (Whitlock and Van Eeckhout, 1980).

Table 5.6-1

Geologic Unit Average Values (Counts per second)

Formation	208Tl	214Bi	40K
Bearpaw Shale	16	126	
Claggett Formation	35	15	126
Eagle Sandstone	35	15	124
Hell Creek Formation	40	16	130
Judith River Formation	39	16	128
Lennep Sandstone	35	14	124
Telegraph Creek Formation	32	17	133
Fort Union Formation	38	14	125
Quaternary Undivided		16	146
Quaternary Terrace Deposits	42	15	133

Source: Geodata International, Inc., 1979.

Table 5.6-2

Uranium Concentrations (ppb) In Water Samples

Comanche Basin Area

Latitude	Longitude	U Concentration
5.8997	108.7664	3.82
45.9122	108.7764	2.64
45.9439	108.8089	5.38
45.9489	108.8383	6.58
45.9456	108.8269	2.02
45.9978	108.7772	4.13
45.9972	108.7733	4.98
45.9597	108.8531	2.60
45.9450	108.8622	0.04
45.9947	108.8719	8.40
45.9875	108.8378	0.81
45.9939	108.9136	0.34
45.9928	108.9036	1.32
45.9792	108.8817	6.23
45.9136	108.8300	2.61
45.9128	108.8292	1.67
45.9114	108.8686	6.92
45.9339	108.8786	1.78
45.9647	108.8786	0.74

Source: Warchola and Stockton, 1982.

5.7 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

5.7 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

The Montana State Historic Preservation Office (SHPO) has identified 85 prehistoric and historic sites within the townships traversed or circumscribed by the proposed project (Table 5.7-1). Most of these sites were recorded in the 1960's and early 1970's by members of the Billings Archaeological Society, when the standards for recordation were not as exacting as they are today. Only one of the recorded sites is listed on the National Register of Historic Places. Evaluation of many of the sites' significance and eligibility for registration would require further field visitation and study (Stanfill, 1987a).

The site listed on the National Register of Historic Places is a log hotel which once was the Antelope Stage stop on the historic stage route from Billings to Lavina (Figure 5.7-1). It is located in Area C, the campus expansion area. Any adverse impacts to the structure, therefore, may be avoided by appropriate site design at the campus. The structure may, in fact, be incorporated as a positive element in the campus design. The potential impacts to this structure and the other prehistoric and historic sites in the area are discussed in Section 5.8.9.

Since the area also has not been extensively or systematically surveyed to date, other sites may exist. The SHPO, however, believes that the recorded sites are probably representative of the range of site types that occur there (Stanfill, 1987b). Most of the cultural resources at the recorded sites are relatively common to the general region.

It should be pointed out that a significant percentage of the land surface at the proposed site has been disturbed for cultivation and grazing, as well as other land uses. This may well have resulted in the destruction of other cultural resource sites in the area. The surface water characteristics of the area, such as periods of significant runoff and ponding, likewise may have resulted in a higher than usual rate of site destruction for the locale.

5.7.1 Prehistoric Resources

There is evidence of human occupation of the region through all prehistory, encompassing three general culture periods: Paleo- Indian (10,000-5,500 B.C.); Plains Archaic (5,500 B.C.-A.D. 500); and Late Prehistoric (A.D. 500-1800). During all three periods, life on the Northwestern Plains involved hunting and gathering. Because of this, the people lived in small groups, had no permanent settlements, and possessed only limited tools made of stone, wood, or bone. Most of the prehistoric sites, therefore, are small, containing limited evidence of brief inhabitation or use (BLM, 1981; Fredlund, 1981; Ruebelmann, 1983).

Prehistoric sites in the area may be classified according to four functional types: habitation, procurement, industrial and ritual. Habitation sites, which evidence everyday domestic activities, include camp debris scatters, hearths, cairns and tipi rings. Procurement sites, associated with hunting and gathering subsistence activities, may include buffalo jumps, traps, pounds and related processing areas. Industrial sites would include quarries and workshops made up of scatters of lithic waste debris, hammerstones, rough or damaged tools and chunks of workable fine-grained rocks. Ritual sites in the region may consist of petroglyphs, pictographs, burials, medicine wheels, and rock or wooden structures for vision quests or other purposes (Ruebelmann, 1983).

The U.S. Bureau of Land Management has compiled a list of site types found on BLM lands in the region, broken down by cultural period and presented in Table 5.7-2. Lithic sites comprise the majority of prehistoric sites in the region, followed by tipi rings, hearths and fire-cracked rock, and rock art (BLM, 1983b).

The distribution of these prehistoric sites in the region varies according to environmental zones and topographic features. Sites average one or two per section of grassland or prairie zone and two or three per pine timbered zone (BLM, 1983b). Sites in all environmental zones tend to be associated with topographic features, particularly uplands areas, areas within 1.5 mile of watercourses, and dessicated topography (John Taylor, 1987). The older the site the more rare it tends to be, due to the greater likelihood of destruction by erosion and other elements. Comparatively recent sites, therefore, are the most common in the area (BLM, 1981).

The types of prehistoric sites identified by SHPO for the project vicinity include: lithic scatters, tipi rings, rock alignments, cribbed log structures, rock shelters, vision quest sites, petroglyphs and pictographs. Lithic scatters, followed by tipi rings, are the most prevalent type of site, with only a few instances of the other cultural site types. As might be expected, prehistoric site density is lowest in the central part of the basin, increasing toward the perimeter with elevation or environmental and topographical complexity (Stanfill, 1987a).

The nearest area of known archaeological significance is the Hoskins Basin Archaeological District, outside the northeast perimeter of the Comanche Basin site [T3N, R25E, Secs 5,7,8,17; T4N, R25E, Sec 31]. The District contains five sites with cribbed log structures, a rare conical timber lodge or wickiup, a vision quest structure, lithic scatter with component hearths, and bone debris. Hoskins Basin was determined an Archaeological District by the Fish and Game Commission in 1975, and now is listed in the National Register of Historic Places (Fredlund, 1981; BLM, 1983b; BLM, 1983a).

Table 5.7-1

Recorded Cultural Resource Sites
(T. 2-5 N, R. 22-25 E)

Township	# Recorded Sites	Range of Types
T2N, R22E	0	--
T2N, R23E	10	Tipi ring sites
T2N, R24E3		Tipi rings, commercial grain elevator, lithic scatter
T2N, R25E	5	Lithic scatters, tipi rings, bridges
T3N, R22E	5	Lithic scatters, tipi rings, rock alignments, pictographs
T3N, R23E	1	Tipi ring site
T3N, R24E	4	Hotel, commercial grain elevator, residences
T3N, R25E	17	Cribbed log structures, vision quest sites, tipi rings, lithic scatters
T4N, R22E	1	Petroglyphs/pictographs
T4N, R23E	14	Historic residences, commercial buildings, railroad, business block, church
T4N, R24E	1	Lithic scatter site
T4N, R25E	8	Lithic scatter sites, rock shelter petroglyphs, cribbed log structure, fortification/lookout
T5N, R22E	7	Bridges, lithic scatter site
T5N, R23E	2	Rock shelter, bridge
T5N, R24E	0	--
T5N, R25E	7	Historic mining, pictographs and petroglyphs, lithic scatters and tipi rings

Source: Stanfill, State Historic Preservation Office, 1987

Table 5.7-2

Cultural Resource Types and Chronology

Cultural Period	Cultural Site Types
Paleo-Indian (10,000-6000 BC)	lithic scatters caves rockshelters
Early and Middle Plains Archaic (6000-1000 BC)	lithic scatters caves rockshelters hearths
Late Plains Archaic (1000 BC - 500 AD)	lithic scatters caves rockshelters hearths cairns bison kills rock alignments cribbed log structures tipi rings
Late Prehistoric (500-1800 AD)	lithic scatters caves rockshelters hearths cairns bison kills rock alignments rock art cribbed log structures tipi rings
Early Historic (1800-1880)	lithic scatters hearths cairns bison kills rock alignments rock art cribbed log structures tipi rings burials medicine wheel historic trails trading posts
Late Historic (1880-1930)	homesteads mining, oil and gas debris

Source: BLM, 1983

5.7.2 Historic Resources

The recorded early historic period for the region began with exploration of the territory by the Lewis and Clark expedition of 1804-1806, which followed the Missouri River to the north of the proposed site, and returned by the Yellowstone River to the south. They were followed by organized fur traders, whose trading posts and activities (1820-1860) were largely confined to the same river basins, where forts also were established. By the 1860's, fur trading was on the decline, but these rivers became major transportation routes to the gold fields in western Montana. The continued influx of people brought increased conflict with the Native American population, resulting in military campaigns that left camps, posts, forts and battlesites.

By the late 1880's, the region was pacified and was further opened up by the railroads. The area nonetheless was settled very slowly, beginning with large cattle and sheep operations, as well as mining operations in the Bull Mountains and elsewhere in the region. There was a major population influx between 1915-1922 with changes in the Homestead Act, but many homesteads, particularly those dependent upon dryland farming, were later abandoned due to a series of adverse weather and market conditions characterizing the 1920's and 1930's (BLM, 1981; Fredlund, 1981; Anderson, 1984).

Cultural resource sites recorded by SHPO for the project vicinity are listed in Table 5.7-1. The types of historic sites identified by SHPO include:

Broadview	Historic residences, commercial buildings, railroad, business block, church
Comanche	Hotel, commercial grain elevator, residences
Acton	Commercial grain elevator
Northeast	Historic mining

SHPO also identified several bridges recorded for the area which are believed to be "stringer timber bridges" over 50 years old, of interest primarily for their engineering values (Stanfill, 1987b).

Figure 5.7-1 ANTELOPE STAGE BUILDING

South side. August 1982.

East side. August 1982.

5.8 PRELIMINARY ENVIRONMENTAL EVALUATION

5.8 PRELIMINARY ENVIRONMENTAL EVALUATION

The purpose of the preliminary environmental evaluation is to identify environmental impacts that would require special attention or could limit the use of the Comanche Basin site. The evaluation is based on results of initial consultation with affected federal, state, and local resource agencies, field reconnaissance, analysis of available data and information and interpretation of aerial photography. Assessment focused on major surface disturbances and socioeconomic effects associated with the construction and operation of the SSC at the proposed site.

Based on the proposed facility arrangement, major surface disturbances include:

- Facilities. The campus and injector areas (A, B, and C) will require a total of 3500 acres. A large percentage of this area is reserved for future expansion, and so will not be disturbed unless and until the campus is expanded in the future. The collider arcs (area D) will be built mostly by tunneling. Approximately 3.5 miles of the arcs will be built by cut-and-cover methods, disturbing the surface. The intermediate access (E) and service areas (F) on the collider arcs will result in the disturbance of approximately 0.9 and 5.7 acres each, respectively, for a total disturbed surface area of 6 and 34 acres. The abort/external beam access areas (J) will each require 40 acres, for a total of 240 acres of disturbed surface. Approximately 2.1 to 2.6 million cubic yards of "spoil" material will be excavated from the tunnels. All of this material will be used to upgrade the road system and provide fill material in the campus area.

- Road Network. Access to the SSC facilities during construction and operation will be provided by improvement of existing roads and construction of new roads. Major improvements are planned for Montana Highway 3, the Acton to Campus road, and the Acton to F5 road. All road improvements will include widening and building up of the existing grade and paving of the road surface. About 90 miles of existing road will be upgraded, while about 8 miles of new road will be built.

- Pipelines. Water and natural gas will be supplied to the SSC by new pipelines coming into the area from the outside. The distribution of water and natural gas to the SSC facilities will require the construction of distribution pipelines within the Comanche Basin. These distribution pipelines will be placed adjacent to the access roads to avoid additional surface disturbances.

- Powerlines. Two new powerlines will be built to provide electrical service to the SSC facilities. One powerline will run along existing electrical corridors from the Broadview substation to the campus area. A second powerline will run from the Broadview substation to the F5 area. Further distribution of electricity from these two locations will be through the tunnel, so there will be no additional surface disturbances due to powerlines.

Also included in the evaluation were the socioeconomic effects of the construction and operation of the SSC. The SSC will attract approximately 10,000 people to the area. Most of these people will likely choose to live in Billings, because it is nearby and because of the amenities available there. Billings already has in place surplus capacity to serve the new population. In addition, the city has expressed its willingness to supply whatever additional services are required to support the SSC.

Several other aspects of the project were considered but not included in the preliminary environmental evaluation, as follows:

- Pipelines Off-Site. Natural gas will be supplied by a new pipeline from the northwest of the Comanche Basin. Potable water and industrial water will be supplied by a new water pipeline from Billings. The precise route of these pipelines, outside the Comanche Basin site, has not yet been determined.

- Waste Disposal. Specific plans for the transport and disposal of waste materials have not been developed. Sewage generated after the SSC is in operation will be treated at the sewage treatment plant to be constructed near the campus area. Sewage disposal for intermediate access and service areas will be effected by septic tanks or portable chemical facilities. The solid waste generated by the SSC will be carried offsite to the existing Billings disposal facility. The hazardous waste produced by the SSC also will be transported to a certified hazardous waste disposal facility in Colorado or Utah.

- Decommissioning. DOE has not yet formulated specific plans for the decommissioning of the SSC (Ref. DOE answer to Question No. 644, 7/17/87). It is expected, however, that decommissioning impacts can be minimized through cooperative advance planning, and by taking advantage of the ancillary regional economic development and continued economic diversification fostered during the SSC's operational years.

Based on current information, the state of Montana does not expect any of the above considerations to cause significant impacts that could limit the use of the site.

5.8.1 Topographical, Geological, and Soil Resources

5.8.1.1 Topographical Resources

The proposed project is unlikely to have any major impact on topographic resources of the area. Some site leveling will be required for construction and some final landscaping. The campus area will constitute most of these impacts, followed by the west cluster, with the rest at isolated service, access, and other small facilities around the collider ring. Some of the proposed access road improvements and construction, as well as sewage and other wastewater ponds, also will involve small-scale topographic impacts.

Most of the collider ring itself will be constructed by tunneling, with no topographic impacts. The ring will be constructed by the cut-and-fill method at four locations: One cut approximately 2 miles long and 300 feet wide at a stretch between F2 and E3 running southwest of Acton; another cut from E5 to K4 in the far cluster, approximately 1.5 miles long, and about 500 feet wide in the middle but tapering to 200 feet wide at each end; a cut approximately 500 feet long and 200 feet wide at the Gooseneck Creek drainage near E7; and a cut approximately 200 feet by 200 feet between the railroad tracks and Montana Highway 3 at the northern arc of the ring. These cut-and-fill lands will be graded to approximate their original contour. At the two larger areas, the topography will be smoothed out somewhat along the path of the ring to provide adequate cover for the tunnel. The most significant impact will be removal of approximately 150 feet of hilltop between cut E5 and K4. The geomorphology of all drainages intersected by cut-and-fill construction, such as the Gooseneck Creek drainage, will be reestablished as nearly as possible in terms of channel width and gradient of floor.

5.8.1.2 Geological Resources

Geological resources at the site will not be significantly impacted by the project. Specifically, tunneling for collider ring construction should not result in any surface subsidence, given the depth and geological characteristics of the tunneling zone. Nor will there be any likely subsidence at areas of cut-and-fill construction, due to the requirement for controlled compaction of the replaced excavation material.

5.8.1.3 Soil Resources

Soil resources will be impacted at all areas of surface disturbance. According to the Soil Conservation Service, there are no prime farmlands at the site (Robertson, 1987). Typically there is only one relatively thin zone of topsoil.

The reclamation plan calls for removal and stockpiling of all topsoil from disturbed areas to be used to reclaim areas exposed after construction of surface facilities. If this topsoil resource is inadequate in any given area, soil from other sources must be procured and applied. To reclaim areas of Bearpaw shale, for example, it will be necessary to cover those areas with a sandy loam material, which probably will be available from construction elsewhere within the site. Once applied, the topsoil must be stabilized through revegetation to minimize erosion.

Impacts on topsoil resources at the site, therefore, will be temporary except where permanent facilities stand. Construction plans and schedules will adequately mitigate the interim erosion and loss of soil resources in the course of construction, both minimizing and localizing potential impacts. Montana's past research and experience in the reclamation of large-scale surface mined lands will ensure that state-of-the-art proven reclamation techniques are utilized to minimize impacts on soil, land, and vegetation resources during SSC construction.

5.8.2 Water Resources

Potential impacts of the project on the existing surface water and groundwater regimes at the site are expected to be localized and transient. From the standpoint of residents, the impacts are positive in that more abundant, better quality city water will be available for local use as a result of the project.

Surface water and groundwater resources in the Comanche Basin do not appear to intermix (Odell, 1987). The land surface generally is underlain, at relatively shallow depths, by layers of impermeable subsoil or rock, causing any water which does soak into the surface to move laterally. At certain outcrop areas, this may occur as saline seep. Surface runoff may stand in the basin for long periods of time until evaporated. At the same time, the groundwater aquifers are largely recharged from outside the basin. Apart from several minor springs and local wells groundwater generally does not appear at the surface (Wilson, 1987).

Surface water drainage may be altered in areas where construction disturbance cuts these impermeable subsurface layers, and surface water and groundwater regimes may intermix unless impermeable layers are re-established. The most negative potential effect of altered surface drainage is that saline seep may occur in new locations as water percolates to lower impermeable zones prior to lateral movement. It should be noted that even if this occurs, the impact will be highly localized and relatively insignificant, since the amount of water involved is only a portion of the total precipitation, which in turn represents a small percentage of the land base in the watershed (Id.).

5.8.2.1 Groundwater Resources

Groundwater quantity at the site may be affected by the proposed project, primarily by construction in the immediate vicinity of existing wells. Such effects will be mitigated, however, even resulting in improved water supplies to some affected landowners.

Construction of the collider ring, both tunneling and cut-and-fill, will have the most impact on groundwater resources. Approximately 18 miles of this construction will penetrate the two primary aquifers in the area, and roughly another 4 miles will penetrate pervious fault zones which may carry additional water. A requirement for construction through these areas, therefore, will be temporary dewatering. This will entail pumping water from the tunnel or pit areas until the ring liner is in place and construction moves on.

Dewatering will draw down or even interrupt groundwater supplies to wells within approximately 100 feet of the construction, possibly requiring that potable water be hauled to and stored for landowners. Adequate stockwater may be provided by the dewatering discharge itself. The local groundwater regime will probably return to its prior condition once construction in the vicinity is ended (Odell, 1987). There is a remote possibility that the groundwater supply to a given well may be affected by the ring itself blocking off part of the seam feeding that well. This may be mitigated, if and where it occurs, by providing an alternative well for landowners in unaffected areas or by providing them with hook-ups to the city water system planned to support the SSC facility.

Some existing wells will also be taken out of service intentionally, sealed and abandoned. These permanent impacts will be mitigated by providing alternative wells or city water hook-ups.

Groundwater quality in the area is not expected to be adversely affected by construction or operation of the facility, provided materials and water discharges associated with such activities are properly handled, as discussed below. Underground construction will not contaminate groundwater, and DOE has indicated that project operation poses no problems with respect to irradiated groundwater.

5.8.2.2 Surface Water Resources

Virtually all impacts on the surface water system will be confined to the Comanche Basin. The western part of the proposed collider ring route, however, involves cut-and-fill operations which will impact two additional watersheds. One is the Lake Basin, another internally drained basin to the southwest, and the other is the Painted Robe Creek watershed to the northwest, which drains to the Musselshell River. All of these features are classified as intermittent streams (USGS, 1:24,000 quad maps), with streamflow patterns similar to those of the Comanche Basin. Impacts to these other watersheds, therefore, may be confined to the immediate site through appropriate mitigation measures, as discussed in connection with similar Comanche Basin impacts (Wilson, 1987).

None of the larger named intermittent streams within the Comanche Basin watershed will be impacted, except for a tributary of Difficulty Creek, which will be affected by the large cut-and-fill operation along the southern arc. Likewise, none of the 10 largest ponds, identified in Section 5.2.1 as representing approximately two-thirds of the surface area of the basin's water resource, will be impacted. The only surface water features potentially affected by surface disturbance, therefore, are minor intermittent or ephemeral drainages and possibly some very small ponds or potholes.

Refinement of site design and construction plans, following further study of the area, may ensure that impacts on any surface water drainages are adequately mitigated by design and construction constraints, diversionary facilities, minimum grading requirements, runoff controls, or other appropriate measures to minimize and contain any impacts.

Similar protection will be provided for areas of permanent or intermittent surface water bodies. Given their likely occurrence in the basin, a survey of all potentially affected lands which may be classified as "wetlands" will be conducted, to avoid or properly mitigate any impacts to those areas (Section 5.2.1). Although the proposed site is believed to avoid any areas potentially classifiable as floodplains (Section 5.2.4), affected lands also will be surveyed for this possibility. Following the survey, a floodplain/wetlands assessment will be performed in conformance with DOE regulations (10 CFR 1022.12). This will ensure that all associated environmental and other values are properly considered and adequately protected.

There may actually be a small net increase in the quantity of surface water in the Comanche Basin. The existing surface water resource in the area consists almost entirely of runoff from snowmelt and rainfall within the basin, with minimal contributions from several springs. During construction, approximately 22 miles of the collider ring zone will be dewatered, pumping amounts of groundwater into temporary settlement ponds situated about every 5 miles along the affected area. Water from these ponds could be utilized locally on a temporary basis for agricultural purposes, with no anticipated negative impacts of any significance.

The permanent facilities also will contribute to the basin's surface water supply. It has been proposed that project potable and industrial cooling water demands be met with water from the Billings water system, with wastewater treated and discharged within the basin. For sewage disposal, this will consist of two lagoons, totaling 50-100 acres and situated within 1 mile of the campus area, to be used for evaporation of water discharged from an on-site sewage treatment plant. For industrial cooling water, a number of cooling towers will be situated around the collider ring at which there will be some water loss through evaporation and blowdown. Blowdown will be treated to appropriate water quality standards for discharge at low rates into small on-site evaporation ponds or directly into local drainage systems.

Therefore, no discharge water will be contributed to the existing surface water regime until it is properly treated and unless the amount is small enough to have no significant impacts.

A final important hydrologic consideration of the proposed project is the disposal of excavation material from tunneling and other construction operations. Although a substantial amount of excavation material will be produced (estimated at 2.1-2.6 million cubic yards), all of this material can and will be used in preparing the campus area and in building and improving the project access road network. Most of this excavation material will consist of sandstone, claystone, and siltstone which will not impact water quality. Some of the material, however, will consist of Bearpaw shale, which has saline and other chemical properties and must therefore be replaced in areas of like material.

All potential impacts on surface water and groundwater quality and quantity will be examined in the course of securing all necessary permits and licenses for the project; however, it is unlikely that the proposed project will have any major impacts on the local hydrologic regime.

5.8.3 Ecological Resources

5.8.3.1 Botanical Resources

Impacts on the botanical resources will be confined to areas of surface disturbance. Within those limited areas, impacts to vegetation will be substantial in the course of construction but will be largely mitigated through subsequent reclamation. Natural and agricultural vegetation will be permanently lost only on the relatively small percentage of land occupied by permanent surface facilities.

The vast majority of native plant species at the Comanche Basin are common to much of eastern Montana (Ross and Hunter, 1976). The sole exception is wetlands-type vegetation, the extent of which is not known but which will receive adequate protection through the required wetlands assessment outlined in Section 5.8.2. No threatened or endangered plant species are known or expected to occur in the project vicinity; however, field investigation will be conducted to ensure that no such species exist in affected areas, and that impacts on any such species found will be adequately mitigated.

All disturbed areas of natural vegetation, other than those occupied by permanent facilities, will be reclaimed and revegetated. Every major component of the native flora is available in seed, so that each area can be reclaimed to its approximate original condition. The necessary materials and expertise for such restoration have been developed already for surface mine reclamation at many other similar sites in southern Montana. Growing conditions for successful revegetation at the Comanche Basin site also are considered excellent. Although the area does not receive substantial annual precipitation, much of the precipitation it does receive is concentrated during the most critical part of the local growing season. No special efforts, therefore, will be necessary to ensure successful revegetation (Hines, 1987).

It should be remembered that the site is not a pristine area. Most of the affected land at the site is or has been subjected to cultivation or grazing. Areas of agricultural land use disturbed by project construction also will be restored by appropriate cropland revegetation.

5.8.3.2 Wildlife Resources

Construction of the project is not expected to have any significant, long-term impacts on the wildlife resources of the area. The most significant long-term impact on wildlife will be increased contact with people, as access to the area is improved and the human population increases. Wildlife will tend to avoid the few concentrated areas of human activity; however, increased roadkills and hunting pressure will occur throughout the project vicinity. Populations of local wildlife in most years are sufficiently abundant to sustain any such losses. (Id.)

The most significant short-term impact on wildlife will be the loss of some habitat from construction operations and associated noise and commotion. This is expected to cause only minor dislocation in most areas, with wildlife quickly reestablishing themselves elsewhere in the vicinity, and later frequenting reclaimed land (Hoem, 1987).

The proposed site does not support, and is not expected to support, any populations of threatened or endangered wildlife species (Eustace, 1987; Hoem, 1987). While individual bald eagles and peregrine falcons have been observed in the vicinity on rare occasions, their presence is believed to be incident to migration (Fries, 1987a). The likelihood of impacts on these species, therefore, is very small, and would be limited in any event to increased human activity. There is ample alternative habitat suitable for stopovers in the surrounding region. Affected lands at the proposed site will be surveyed to ensure that no threatened or endangered species will be impacted, or that appropriate mitigation measures will be undertaken.

The only wildlife habitat of any particular significance at the Comanche Basin site are the wetlands areas, although their significance varies from year to year with the extent of the available water resource. As previously noted, these areas may attract upwards of 100,000 waterfowl for breeding and stopover purposes during a wet year, or only a few hundred of waterfowl during a dry year. The most significant water body in the basin, constituting approximately 55 percent of the surface area of the basin's surface water resource, is the Spidel Waterfowl Production Area (WPA) administered by the U.S. Fish and Wildlife Service. In the past six or seven years, it has been completely dry at least one year, and so full for two others that it was a foot and a half deep over the county road that crosses it (Fries, 1987b).

Because of their largely intermittent or ephemeral nature, it is difficult to define the location or scope of these potential wetlands, and therefore the likely impacted areas. The collider ring actually will tunnel directly underneath the Spidel WPA, without any anticipated surface effects due to the required tunnel depth. None of the other large water bodies is expected to be affected. Survey, assessment, and protection of any potentially affected wetlands is discussed in Section 5.8.2. It may be possible, moreover, that the temporary disturbance or even the permanent loss of any existing wetland habitat can be easily mitigated. Affected areas could be restored or even enhanced following any construction disturbance, primarily by deepening, and equivalent wetland habitat could be created elsewhere in the basin if an existing site were eliminated.

There is one further consideration of concern for waterfowl, and that is the proximity of powerlines to their wetland habitat. The Comanche Basin already is crossed by a number of high voltage lines which pose a potential threat to waterfowl using the basin. New powerlines should be routed to minimize impacts near potential wetland habitat. For this reason, the two new high voltage lines should follow existing power corridors, so that no new plane of obstruction to waterfowl flight is created, or sited at a safe distance from identified wetlands areas. All lower voltage distribution lines will be placed underground in the collider tunnel. Any new wetland habitat created should be situated at a safe distance from new and existing high voltage lines.

As discussed in relation to vegetation impacts, a relatively small amount of other wildlife habitat, consisting primarily of grasslands and shrub/grasslands, will be disturbed during tunneling and facilities construction. This habitat will be either replaced by permanent facilities, or will be reclaimed to its approximate original condition, suitable again for wildlife habitat. None of these affected areas constitutes critical wildlife habitat. Disturbed lands also represent only a small percentage of similar habitat available throughout the region.

5.8.4 Land Resources

The existing land use of virtually all affected areas is either dryland farming or livestock grazing. While the Comanche Basin site is a productive area for such uses, the land resource is not unique. Only a small percentage of the basin's land will be affected.

Agricultural lands disturbed during construction will be returned to their prior use, except in those areas conveyed in fee simple to the federal government (See Section 2.1.6). Any such areas not occupied by above ground facilities could be leased back to the landowner for agricultural purposes at the discretion of the DOE.

5.8.5 **Socioeconomics**

The potential socioeconomic impacts associated with a project of this magnitude are a function of the size and characteristics of the in-migrating population associated with the project. The "new" population will create demands on public, quasi-public, and private services and facilities, including:

- Water and sewer facilities and services,
- Educational services and facilities,
- Police and fire services and facilities,
- Streets and roads,
- Housing,
- Utilities (gas, electricity, telephone),
- Retail services (motels, restaurants, shopping, etc.)
- Social services,
- Medical facilities and services

The types of impacts and the levels of impact will be a function of several factors, including:

- Size and timing of population in-migration (number of people, duration of stay, "peak" population levels)

- Characteristics of the new population (ages, family size, income, educational and skill levels)

- Work forces associated with the construction and operation periods will create different types of demands due to differences in skills, amount of time at the site, family accompaniment, commuting patterns, etc.

A preliminary analysis of the potential impacts associated with the construction and operation of the SSC facility in Montana shows two main geographical areas of potential impact:

- The City of Billings
- The immediate area around the project site, which includes the community of Broadview

The level of impact will be a function of local labor force participation rates, the characteristics of the in-migrating work force and the geographic distribution of the in-migrants. Based upon the distribution patterns of non-local construction workers and operations workers on major projects in the west (Colstrip, Montana; Beulah, North Dakota; and Wheatland, Wyoming, for example), almost all of the labor force will locate in Billings. This is due to the amenities offered and proximity of the city to the project area (approximately 20 miles). At this time, it does not appear that Billings will receive any significant negative impact from the project, for the following reasons:

- The city has, in place, surplus capacity in the physical infra-structure necessary to serve the new population. This is true in housing, water and sewer treatment, distribution and collection fire and safety facilities, utilities, medical facilities, and education facilities. While additional staffing and some equipment might be required, these are not major expense items. In addition, the city has expressed its willingness to provide whatever services are necessary to support the project-related population.

- Forecasting models are available and have been used in the area to estimate population inflows, facilities and services impact, and revenue (tax) flows. By developing reasonable forecasts and monitoring project activities, it is possible to plan both for growth and decommissioning needs of the project well in advance, in order to minimize any potential negative impacts.

- Data bases on Billings and the region are available that can aid forecasting, in terms of timing and levels of accuracy.

Because Broadview is small and the area between Billings and Broadview is sparsely populated, some impacts can be expected in the immediate project area. Even low levels of population in- migration will create demands that exceed existing capacities in all of the categories described above. In addition, improvements to the highway linking the project to Billings will have to be made and additional transportation services offered. However, with proper planning (using the forecasting tools and data bases in place), growth can be forecast and steps taken to mitigate potential negative impacts. Local governments have expressed their willingness to address the needs which will occur, both in terms of facilities and services. Eventual decommissioning needs can likewise be addressed through good planning, and these potential impacts can be further minimized by continued development of the Billings area's existing diversified economic base through encouragement of a "spin off" high tech component of that economy during the operational years of the SSC project.

A final potential concern relates to the issue of relocating the few property owners affected by the project. The state will work with these property owners to ensure that they are fairly compensated and will aid in any necessary relocation.

5.8.6 Health and Safety

Sting the SSC project in the Comanche Basin area is not believed to present any significant public health and safety problems. Anticipated potential public health and safety impacts are mostly generic, and would occur wherever the project was sited. The relatively low existing population base at the site, will limit the magnitude of these impacts.

Project impacts on air and water quality will be limited and also will be adequately mitigated to ensure no adverse public health and safety effects.

Oher potential public hazards center on increased traffic during both construction and operation. Any such hazards may and will be mitigated by proposed new or improved roads and traffic control to service the site. Other potential operational hazards relate to the transport, storage, and handling of hazardous materials at the SSC facilities. Since only relatively small amounts of such materials will be used, any accidents involving them will be very limited in effect, typically on-site. One possible exception is the transport and storage of large quantities of compressed or liquified gases for cryogenic use. Any associated transport and storage problems associated with these gases are not specific to the Comanche Basin site and indeed are mitigated to some degree by the proposed site's comparatively unpopulated area. Any hazardous waste generated by SSC operations, such as tritiated water and low level radioactive solid waste, also will be small in quantity, and will be handled in a proven safe manner and disposed of only at certified facilities.

DOE has not indicated any public health and safety problems associated with experiments conducted at the facility, provided there is adequate cover for the collider ring.

5.8.7 Noise

With its low population and agricultural land use, the site area is comparatively quiet. Construction will generate considerable heavy equipment noise in active construction areas. Both construction and operation also will increase the volume of rail and highway traffic, along with associated noise. Facility operations themselves will generate relatively little noise, such as pump and compressor sounds.

Noise impacts on wildlife are discussed in Section 5.8.3.2. Long-term noise impacts on the human population are not expected to be appreciable, given the general isolation of most farm residences.

5.8.8 Air Quality

No difficulty is anticipated in complying with all applicable air quality standards for the area.

The air quality of the site is typical of other rural agricultural areas in eastern Montana, where for several months out of the year, the chief problem is with suspended particulates generated by farming and traffic on unpaved roads. Construction at the site will contribute somewhat to total suspended particulates, although this will be substantially mitigated by providing paved access roads to construction areas. Other dust suppression measures also may be appropriate.

Air quality impacts from project operation will consist primarily of vehicle exhaust. There is little that may be done to mitigate the impact, other than ensuring adequate traffic flow in the area.

These impacts, however, are not expected to be particularly significant, given the good dispersion conditions in the area. The relatively high average wind speeds and consequent instability of the atmosphere in the area, together with the lack of any topographic features which could trap air pollutants in stable layers near the surface, ensure that any air pollutants generated at the site will be quickly dispersed.

5.8.9 Historical and Archaeological Resources

The State Historic Preservation Office (SHPO) has identified 13 recorded historical and archaeological resource sites which fall within the sections potentially affected by the project. These include eight tipi rings, three lithic scatters, and three historic structures:

Site Number	Site Type
24 GV 0095	Bridge
24 YL 0004	Tipi ring
24 YL 0005	Tipi ring
24 YL 0006	Tipi ring
24 YL 0007	Tipi ring
24 YL 0009	Tipi ring
24 YL 0010	Tipi ring
24 YL 0011	Tipi ring
24 YL 0019	Lithic scatter
24 YL 0257	Log hotel
24 YL 0563	Lithic scatter/Tipi ring
24 YL 0613	Cribbed log occupation structure
24 YL 1030	Lithic scatter

The only site on the national register of historic places is the former Antelope Stage stop on the original route from Billings to Lavina (24 YL 0257). It is located in T3N, R24E, Section 3, a part of the proposed Area C or campus expansion area. (Id.) Adverse impacts to the structure may be readily avoided through appropriate site design, which could incorporate the historic structure as a positive design element for the campus.

A thorough cultural resource survey of these recorded sites, as well as all affected lands, will be conducted to ensure that impacts on any historical or archaeological resources are prevented or mitigated to the full satisfaction of regulatory authorities. Given the nature of the known and expected cultural resources in the region, this is not expected to pose any significant difficulty to the SSC project.

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REFERENCES

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